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AN IMPERFECTION OF THE EYE, AND TEST OBJECTS FOR THE MICROSCOPE.

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My object in this short communication is to call attention to the fact that fine, parallel lines, whether drawn artificially or existing in natural objects, do not make fair test objects for the microscope. This is caused by an imperfection very common in our own eyes. In order to make that clear, I would call the attention of the Society to the formation of the image of any object on the retina of the eye. It is well known that this optical instrument is constructed like the camera obscura; anteriorly there is a lens, and at its focus a part upon which the image is received. Theoretically, the lens should have a perfect spherical surface, and therefore the image should be equally well defined in all its parts. With the camera obscura this is often the case. In the human eye, however, the lens has its power augmented by a refracting surface, called the cornea, which lies in front of it. When the type of perfection is attained, this cornea and lens have perfect spherical surfaces, and, therefore, the focus which they form upon the retina is equally distinct in every direction, vertically or horizontally. Practically, however, this type of perfection is seldom or never attained. The imperfect curvature is usually found in the cornea; instead of being a section of a sphere, it is more curved in the vertical than in the horizontal meridian, and might be compared, in a rough way, to the convex surface of a spoon, when that is held horizontally. This variation from the typical form can be shown by a number of simple experiments.

If, for example, a circular pin-hole be made in a card, and held at varying distances from the eye, it will appear horizontally oval at one point and vertically or obliquely oval at another. The same principle can be illustrated in still another way. If upon a sheet of paper a number of equally dark lines be drawn, radiating from a single point, like the spokes of a wheel, and this figure be held at a distance from the eye, it will be found that certain of these lines appear to be darker than others, although, in reality, they are all the same. It is unnecessary to multiply the experiments. The existence of this peculiarity has long been well known to oculists under the name of astigmatism. The great authority in the refraction and accommodation of the eye, Professor Donders, treats astigmatism as one of the qualities of the normal eye. The practical fact is, that we all possess this imperfection in a greater or less degree. When it passes beyond a certain point it then is classed as morbid, and requires suitable glasses to correct it. Now the point to which I wish to direct attention is, that when a person looks through the microscope at a series of fine parallel lines, it occurs very frequently that they cannot be seen on account of this peculiarity of his eye. At any rate, when one of Nobert's test-plates is subjected to examination, the perpendicular lines which one person would see perfectly well would not be seen by another person who might consider his vision in every way perfect. The same, of course, holds for other tests of a similar nature, such as diatoms of objects darked with fine dots or lines in close juxtaposition. This is by no means an imaginary difficulty, as it has been my experience more than once to find this difference of opinion between persons who are accustomed to view similar objects, and whose eyes and hands are trained to the use of the microscope. Fortunately, however, there is a very simple method of overcoming this difficulty. This consists in revolving the object on the stage of the microscope in such a way that lines which at first were vertical, become afterwards horizontal, for when turned through an arc of one hundred and eighty degrees, they then pass through every meridian in which it would be possible to see them, provided the amplification and definition be sufficient to make them at all visible. This question of the relation of astigmatism to test objects for the microscope, seems to have been overlooked by most, if not all, writers on the subject. Upon examination, however, it would appear to be of considerable importance, and as such I venture to direct to it the attention of the Society.